

WHAT IS CLAIMED IS:

1. A method of forming a beveled writing pole of a perpendicular writing element comprising steps of:
  - (a) forming a ramped step having a high side, a low side, and a ramp portion connecting the high side to the low side;
  - (b) forming a writing pole portion on the ramped step having a top portion overlaying a beveled portion; and
  - (c) defining a pole tip of the writing pole portion having an air bearing surface and a thickness substantially corresponding to a thickness of the top portion.
2. The method of claim 1, wherein the forming step (a) includes:
  - (a)(1) forming a vertical step having first and second sides respectively corresponding to the high and low sides of the ramped step; and
  - (a)(2) depositing a layer of material over the vertical step to form the ramped step.
3. The method of claim 1, wherein the forming step (a) includes:
  - (a)(1) forming a vertical step having first and second sides respectively corresponding to the high and low sides of the ramped step; and
  - (a)(2) forming a lift-off mask on the first side; and
  - (a)(3) milling the second side and exposed portions of the first side of the vertical step to form the ramp portion.

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4. The method of claim 1, wherein the forming step (a) includes:
- (a)(1) forming a conductive layer on an insulating material;
  - (a)(2) forming a trench on the conductive layer with photoresist dams whereby a portion of the conductive layer within the trench is exposed;
  - (a)(3) plating a conductive material within the trench on the exposed conductive layer to form a step member;
  - (a)(4) removing the photoresist dams to expose the step member and form a vertical step; and
  - (a)(5) depositing a material over the vertical step to form the ramped step.
5. The method of claim 4, including a step of removing the conductive layer that is not covered by the step member prior to performing the depositing step (a)(5).
6. The method of claim 1, wherein the forming step (b) includes:
- (b)(1) depositing a first magnetic layer over the high side, the low side, and the ramp portion of the ramped step;
  - (b)(2) polishing the first magnetic layer down to approximately the high side of the ramped step to form the beveled portion; and
  - (b)(3) depositing a second magnetic layer over the beveled portion and the high side of the ramped step to form the top portion.

7. The method of claim 1, wherein the forming step (b) includes:  
(b)(1) depositing a first magnetic layer over the high and low sides of the ramped step; and  
(b)(2) polishing the first magnetic layer down short of the high side to form the top portion.
8. The method of claim 1, wherein the forming step (b) includes:  
(b)(1) depositing a first magnetic layer over the high and low sides of the ramped step;  
(b)(2) polishing the first magnetic layer down to approximately the high side of the ramped step to form the beveled portion; and  
(b)(3) trimming the ramped step and a wedge point of the beveled portion from the high side to the low side to define the top portion.
9. The method of claim 1, wherein the forming step (c) includes trimming the ramped step and the writing pole portion from the high side to the low side to substantially a wedge point of the beveled portion.
10. The method of claim 1, wherein the ramped step is formed of an insulating material and the writing pole portion is formed of a magnetic material.
11. The method of claim 10, wherein:  
the insulating material is aluminum oxide ( $\text{Al}_2\text{O}_3$ ) or silicon

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nitride ( $\text{Si}_3\text{N}_4$ ); and

the magnetic material is cobalt-iron (CoFe), cobalt-nickel-iron (CoNiFe), nickel-iron (NiFe), or cobalt (Co).

12. The method of claim 1, wherein the forming steps (a)-(c) are performed in accordance with at least one thin film processing technique selected from a group consisting of photolithography, etching, milling, and lapping.

13. The method of claim 1, wherein the thickness and a width of the pole tip are approximately 200 angstroms or less.

14. The method of claim 1, wherein the ramp portion is sloped at an angle of approximately 45 degrees.

15. A method of forming a writing pole of a perpendicular writing element comprising steps of:

- (a) forming a ramped step having a high side, a low side, and a ramp portion connecting the high side to the low side;
- (b) depositing a first magnetic layer over the high side, the low side, and the ramp portion;
- (c) polishing the first magnetic layer down to approximately the high side of the ramped step to form a beveled portion;
- (d) depositing a second magnetic layer over the beveled portion and the high side of the ramped step to form a top portion, the beveled and top portions forming a writing pole portion; and

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- (e) defining a pole tip of the writing pole portion, the pole tip having an air bearing surface, a thickness substantially corresponding to a thickness of the writing pole portion and a width.
16. The method of claim 15, wherein the forming step (a) includes:
- (a)(1) forming a vertical step having first and second sides respectively corresponding to the high and low sides of the ramped step; and
  - (a)(2) depositing a layer of material over the vertical step to form the ramped step.
17. The method of claim 15, wherein the forming step (a) includes:
- (a)(1) forming a vertical step having first and second sides respectively corresponding to the high and low sides of the ramped step; and
  - (a)(2) forming a lift-off mask on the first side; and
  - (a)(3) milling the second side and exposed portions of the first side of the vertical step to form the ramp portion.
18. The method of claim 15, wherein the forming step (a) includes:
- (a)(1) forming a conductive layer on an insulating material;
  - (a)(2) forming a trench on the conductive layer with photoresist dams whereby a portion of the conductive layer within the trench is exposed;
  - (a)(3) plating a conductive material within the trench on the

exposed conductive layer to form a step member;

(a)(4) removing the photoresist dams to expose the step member and form a vertical step; and

(a)(5) depositing a material over the vertical step to form the ramped step.

19. A beveled writing pole formed of a magnetic material comprising:  
a top portion having an end, which defines a writing pole tip;  
a beveled portion adjoining the top portion and having a bevel that extends from the pole tip; and  
a throat portion formed of the top and beveled portions and having tapered sides that extend from the writing pole tip;  
wherein the bevel increases a thickness of the writing pole proximate the pole tip, and the tapered sides of the throat portion increase a width of the writing pole proximate the pole tip.

20. The writing pole of claim 19, wherein the bevel is angled at approximately forty-five degrees relative to an air-bearing surface of the writing pole tip.

21. The writing pole of claim 19, wherein the tapered sidewalls are angled at approximately seventy-five to eighty-five degrees relative to an air-bearing surface of the writing pole tip.

22. A writing element comprising:

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the writing pole of claim 19;  
a return pole separated from the writing pole by a writer gap and  
connected to the writing pole at a back gap; and  
a conducting coil between the writing and return poles and  
encircling the back gap.

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